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MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole # 21-06-01

Borehole Information

Farm : BX	**Tank :** BX-106	**Site Number :** 299-E33-163
N-Coord : 45,644	**W-Coord :** 53,346	**TOC Elevation :** 653.75
Water Level, ft :	**Date Drilled :** 12/31/1971	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 100	

Borehole Notes:

Borehole 21-06-01 was drilled in December 1971 to a depth of 100 ft with 6-in. casing. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel tubing. Data from the drilling log and Chamness and Merz (1993) were used to provide construction information. Although no information concerning grouting or perforations was available, it is assumed that the borehole was not grouted or perforated since this was not a routine practice during the 1970s drilling campaign. The top of the casing, which is the zero reference for the SGLS, is about 0.5 ft below the ground surface.

Equipment Information

Logging System : 1B	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 02/1997	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number :	1	**Log Run Date :**	06/12/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	9.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	06/13/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	99.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	43.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	3	**Log Run Date :**	06/13/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	44.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	21.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	4	**Log Run Date :**	06/16/1997	**Logging Engineer:**	Gary Lekvold
Start Depth, ft.:	8.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	22.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	5	**Log Run Date :**	06/16/1997	**Logging Engineer:**	Gary Lekvold
Start Depth, ft.:	75.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	60.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Analysis Information

Analyst : R.R. Spatz

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 11/20/1997

Analysis Notes :

This borehole was logged by the SGLS in five log runs. Four log runs were required to log the borehole. An additional log run was performed to repeat an interval of the borehole as a quality check. The pre-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. One of the post-survey verification spectra failed to meet the acceptance criteria established for the peak shape and system efficiency. The energy calibration and peak-shape calibration from the accepted calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The man-made radionuclide Cs-137 was detected in this borehole. The Cs-137 contamination was detected nearly continuously from the ground surface to 3 ft. An isolated occurrence of Cs-137 was detected at 16 ft. An analysis of the shape factors was not performed because the detected Cs-137 count rates were below the minimum required to produce shape factor results.

The K-40 concentration values increase from 39 to 42.5 ft and remain elevated to the bottom of the logged interval (99 ft).

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank BX-106.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

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Log Event A

spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

The interval between 60 and 75 ft was relogged as a quality assurance measure to establish the repeatability of the radionuclide concentration measurements. The radionuclide concentrations shown were calculated using separate data sets provided by the original and rerun logging runs.